Small Business Innovation Research/Small Business Tech Transfer

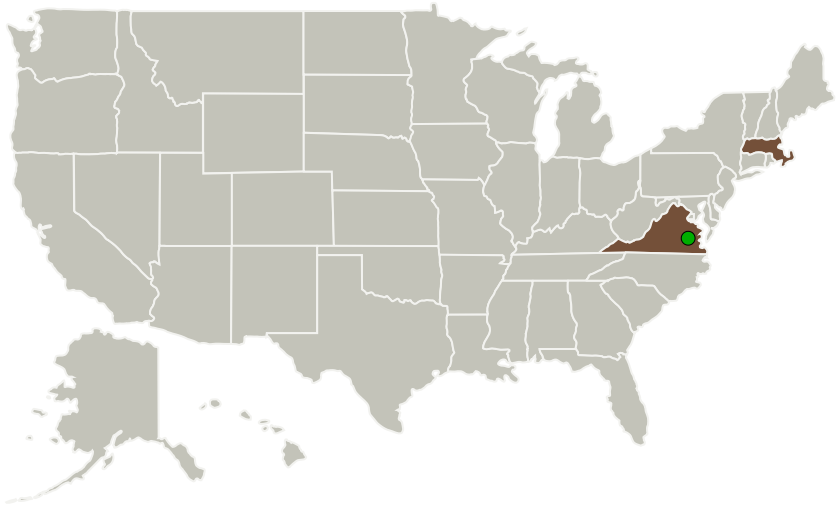
Implementation & Flight Testing of IMPACT System for Autonomous ISR using Collaborating UAVs with Application to Wild Fire Monitoring, Phase II

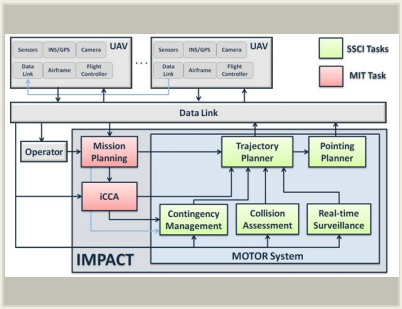
Completed Technology Project (2014 - 2017)

Project Introduction

SSCI and MIT propose to further develop, implement and test the Integrated Mission Planning & Autonomous Control Technology (IMPACT) system software for autonomous ISR missions employing collaborating UAVs. IMPACT system is based on real-time learning about dynamic and stochastic environments, and on a capability to autonomously react to contingencies while satisfying the mission objectives and the overall flight safety. Phase II focus will be on real-time vehicle assignment & trajectory planning technologies for forest fire monitoring, overall system integration, and evaluation of its performance through computer and hardware-in-the-loop simulations and flight tests at Olin College or Great Dismal Swamp. Key technologies to be further developed & tested in Phase II include: (i) Vehicle assignment & real time trajectory generation for collaborative ISR for fire boundary identification using the MOTOR system (Multi-objective Trajectory Optimization & Re-planning); (ii) Robust on-line learning for prediction of the fire spread using the intelligent Cooperative Control Architecture (iCCA); (iii) Collaborative assignment for fire perimeter tracking with reactive trajectory planning based on predicted fire spread using MOTOR and iCCA; (iv) Contingency management, including the loss of vehicle, vehicle replacement & mitigation of lost communication link; and (v) Predictive camera pointing control based on predicted fire spread. The project will leverage a number of technologies recently developed by SSCI and MIT, and integrate various system modules within a flexible and user-friendly software product. Phase II deliverables will include the IMPACT software and accompanying documentation, while Phase III will be focused on commercialization of the IMPACT software.

Primary U.S. Work Locations and Key Partners





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Completed Technology Project (2014 - 2017)

Organizations Performing Work	Role	Type	Location
Scientific Systems Company, Inc.	Lead Organization	Industry Small Disadvantaged Business (SDB)	Woburn, Massachusetts
Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia
Massachusetts Institute of Technology(MIT)	Supporting Organization	Academia	Cambridge, Massachusetts

Primary U.S. Work Locations	
Massachusetts	Virginia

Project Transitions

September 2014: Project Start

March 2017: Closed out

Closeout Summary: Implementation & Flight Testing of IMPACT system for Aut onomous ISR using Collaborating UAVs with Application to Wild Fire Monitoring, Phase II Project Image

Closeout Documentation:

- Final Summary Chart Image*(https://techport.nasa.gov/file/137529)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Scientific Systems Company, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Jovan Boskovic

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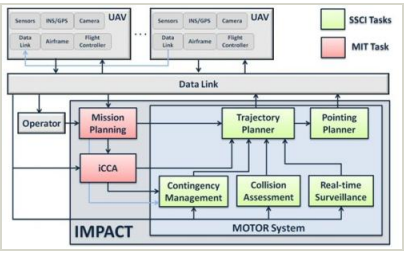
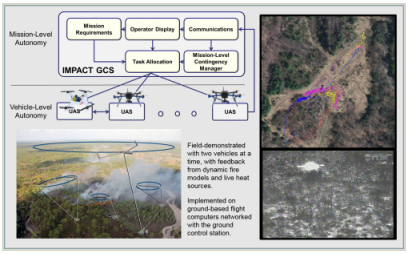
Completed Technology Project (2014 - 2017)

Images



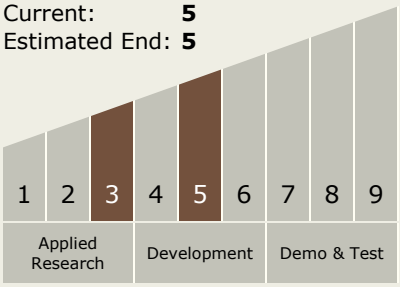
Briefing Chart Image
Implementation & Flight Testing of IMPACT system for Autonomous ISR using Collaborating UAVs with Application to Wild Fire Monitoring, Phase II
(https://techport.nasa.gov/image/132904)



Final Summary Chart Image
Implementation & Flight Testing of IMPACT system for Autonomous ISR using Collaborating UAVs with Application to Wild Fire Monitoring, Phase II Project Image
(https://techport.nasa.gov/image/128134)

Technology Maturity (TRL)

Start: **3**
Current: **5**
Estimated End: **5**



Technology Areas

Primary:

- TX05 Communications, Navigation, and Orbital Debris Tracking and Characterization Systems
  - TX05.5 Revolutionary Communications Technologies
    - TX05.5.1 Cognitive Networking

Target Destinations

Earth, The Moon, Others Inside the Solar System, Outside the Solar System, The Sun, Mars